

### **REMARKS**

Applicant has carefully considered the Office action ("Action") and the references of record. Claims 1-40 are pending. Claims 1-40 have been amended. No claims have been canceled or withdrawn. Withdrawal of the outstanding objections and rejections is respectfully requested in view of the following remarks.

#### **In the Drawings**

A corrected Fig. 1 drawing replacement sheet in compliance with 37 CFR 1.121(d) is submitted with this response. Specifically, Fig. 1 has been amended to show that solid line 104 is an intralayer link, rather than an interlayer link. This amendment is supported by the specification at paragraph [0021], wherein it is stated that "intralayer links 104 connect objects within a same layer 102." Withdrawal of the objection to the drawings is respectfully requested.

#### **In the Specification**

Paragraph [0001] has been amended to specify the US patent application serial number of one of the related patent applications.

Paragraph [0059] has been amended to indicate that the term "T" in the equation (2) refers to the commonly known matrix transposition operation.

### **Claim Objections**

Claims 1, 5, 8-13, 17-19, 21, 22, 26, 29-34, 35, and 38-40 stand objected to in view of claim language informalities. Specifically, and in reference to **claims 1, 13, 22 and 34**, the Action indicates that the feature of "respective ones of two or more multi-type data objects" is vague and indefinite as written; the Office interpreting the feature to mean that "respective ones" are "multi-type data objects". Applicant submits that the Office has correctly interpreted the meaning of the cited portion of claim 1 as filed to mean that "respective ones" are "multi-type data objects". However, for purposes of moving this application towards allowance, Applicant has amended claims 1, 13, 22 and 34 to more particularly point out that the claims are directed to "identifying relationships between multi-type data objects, wherein the multi-type data objects comprise at least one object of a first type and at least one object of a second type different from the first type". Applicant respectfully submits that in view of these claim amendments, a person of ordinary skill in the art could still reasonably ascertain that such identified relationships will necessarily be between "respective ones of two or more of multi-type data objects", as originally claimed. In view of these claim amendments, withdrawal of this objection to claims 1, 13, 22 and 34 is respectfully requested.

As per **claims 5, 8, 13, 18, 26, 29, 35 and 38**, the Action asserts that the limitation "respective ones of the relationships" lacks antecedent basis. Specifically, the Office suggests that "[t]he limitation may refer to the "one of two or more multi-type data objects" in claim 1, but the connection is not clear." Applicant has amended independent claims 1, 13, 22 and 34 so that

the term "respective ones of two or more" is no longer used. Thus, use of the term "respective ones of the relationships" in the indicated objected-to claims should not introduce confusion into the claim language. Additionally, the term "the relationships" has a reasonable antecedent basis in previously recited claim terminology "identifying relationships". Furthermore, because "relationships" necessarily include more than one specific relationship, the scope of "respective ones of the relationships" would have been reasonably ascertainable by those skilled in the art at time of invention. In view of the above, withdrawal of the objections to claims 5, 8, 13, 18, 26, 29, 35 and 38 is respectfully requested.

As per **claims 8, 10, 11, 18, 29, 31, 32 and 38**, the Action asserts that the feature "individual ones" lacks antecedent basis in the claims. Specifically, the Action indicates that the term "individual ones" in these claims may refer to the "respective ones of two or more multi-type data objects" in their corresponding base claims. Applicant has amended independent claims 1, 13, 22 and 34 to remove the term "respective ones of two or more". Thus, use of the term "individual ones" in the indicated objected-to claims should not introduce confusion into the claim language. Accordingly, withdrawal of the objections to claims 8, 10, 11, 18, 29, 31, 32 and 38 is respectfully requested.

As per **claims 8, 18, 29 and 38**, the Action asserts that the phrase "determining similarity between" is grammatically incorrect, appearing to need an article before "similarity". Claims 8, 18, 29 and 38 have been amended to add in article to the term "similarity" (i.e., "a similarity").

Accordingly, withdrawal of the objection to claims 8, 18, 29 and 38 is respectfully requested.

As per **claims 9, 17, 19, 30 and 39**, the Action asserts that the feature "related ones" is indefinite because the term "related ones" may refer to the "respective ones of two or more multi-type data objects" cited in their respective base claims. Applicant has amended independent claims 1, 13, 22 and 34 to remove the term "respective ones of two or more". Thus, use of the term "related ones" in claims 9, 17, 19, 30 and 39 should no longer introduce confusion into the claim language. Withdrawal of the objection to dependent claims 9, 17, 19, 30 and 39 is respectfully requested.

As per **claims 10, 11, 31 and 32**, the Action indicates that the phrase "mutually reinforcing the importance of" appears to need an article before the term "importance". Applicant has amended claims 10, 11, 31 and 32 to place an article before the term "importance". Accordingly, withdrawal of the objection to claims 10, 11, 31 and 32 is respectfully requested.

As per **claims 11 and 32**, the Action indicates that the phrase "is based on the following" is vague and indefinite because "[i]t is not apparent which of the limitations 'reinforcing importance of individual ones' must contain. It is therefore unclear whether the limitations following the phrase are part of the claimed invention." Applicant has amended independent claims 1 and 22, which are the base claims of claim 11 and 32, to remove the term "respective ones of two or more", and thereby, further clarify the plain meaning of the term "individual ones of the multi-type data objects". Thus, the term "wherein mutually reinforcing the importance of individual ones of the multi-type data object within an object type and between

different object types is based on the following:", as recited in claims 11 and 32, clearly includes all of the following features in the claim that follow the colon ":". Accordingly, withdrawal of the objection to dependent claims 11 and 32 is respectfully requested.

As per **claims 12, 21, 33 and 40**, the Action indicates that the phrase "with feature space" is grammatically incorrect, appearing to need an article before "feature". Claims 12, 21, 33 and 40 have been amended to place an article before "feature" (i.e., "a feature"). Withdrawal of the objections to these claims is respectfully requested.

Regarding **claims 17 and 37**, the Action indicates that the limitation "indicated data object relationships" lacks antecedent basis. Claims 17 and 37 have been amended to change the term "indicated data object relationships" to "data object relationships". Applicant respectfully submits that the claimed "data object relationships" would be reasonably ascertainable by a person of ordinary skill in the art at the time of invention as necessarily referring to the particular "relationships" identified in respective base claims 13 and 34. Accordingly, withdrawal of the objections to claims 17 and 37 is respectfully requested.

### **35 USC §112, First Paragraph**

Claims 11 and 32 stand rejected under 35 USC §112, first paragraph, as failing to comply with enablement requirement. In particular, the Action indicates that the meaning of "T" in claims 11 and 32 is not disclosed in either the specification or the claims. Applicant respectfully submits that the term "T" in the equations of claims 11 and 32, and as described in the

specification from paragraphs [0056] two [0060], is a well-known term used to transpose matrices, as shown in equation 2. In claims 11 and 32, the term "T" is used to transpose respective ones of matrices  $\beta L_x$  and  $\gamma L_y$ . Illustrating the extremely common usage of the term "T" in this context to transpose matrices can be found in numerous references in the public domain prior to the filing date of the patent application. For example, please refer to the reference cited in the IDS attached here with to Golub, Gene H.; Charles F. Van Loan (1996), "Matrix Computations", Johns Hopkins University Press, ISBN 0-8018-5414-8.

In view of the above, withdrawal of the 35 USC §112, first paragraph, rejection of claims 11 and 32 is respectfully requested.

### **35 USC §112, Second Paragraph**

Claims 2-12, 14-21, 23-33 and 35-40 stand rejected under 35 USC §112, second paragraph, as being indefinite for failing to particular point out and distinctly claim the subject matter which applicant regards as the invention.

Regarding **claims 11 and 32**, the Action suggests that sense the term " $R_z$ ,  $R_y$ ,  $R_{xy}$ , and  $R_{yx}$ " is not explicitly used in the formula presented in the claims, that the term is indefinite. Applicant submits that even though the term " $R_z$ ,  $R_y$ ,  $R_{xy}$ , and  $R_{yx}$ " is not explicitly shown in the corresponding equations, a person of ordinary skill in the art at the time of invention would reasonably ascertain that the claimed term plainly represents relationships associated with the "sets of heterogeneous object type". Additionally, a person of ordinary skill in the art at the time of invention

would have recently ascertained that the relationships expressed by the terms are necessarily represented by the claimed "adjacent matrixes of links", if "directionality is considered", as recited in the amended claims. Thus, Applicant respectfully submits that the claimed terms do not need to be expressly recited in the equation of claims 11 and 32 to be well understood by one of ordinary skill in the art. However, to more clearly illustrate the relationship between the "sets of heterogeneous object type" and the represented "relationships", and to move this application towards allowance, Applicant has amended claims 11 and 32. Specifically, claims 1132 as amended recite "wherein  $X = \{x_1, x_2, \dots x_m\}$  and  $Y = \{y_1, y_2, \dots y_n\}$  represent respective object sets of heterogeneous object type with relationships  $R_X$ ,  $R_Y$ ,  $R_{XY}$  and  $R_{YX}$  if directionality is considered". This is explicitly described in the specification at paragraph [0058], second sentence.

In view of the above, withdrawal of the 35 USC §112, second paragraph, rejection of claims 11 and 32 is respectfully requested.

Regarding **claims 2-12, 14-21, 23-33 and 35-40**, the Action indicates that these dependent claims should refer back to the claim(s) they further limit. In view of this, the preambles of the indicated dependent claims have been amended to more particularly show antecedent basis on their respective base claims and any intervening claims. For example, the preamble of claim 2 has been amended to change "A method as recited in claim 1" to "The method of claim 1". In view of these claim amendments, withdrawal of the 35 USC §112, second paragraph, rejection of these claims is respectfully requested.

### 35 USC §101

Claims 1-11, 13-20, 22-32 and 34-39 stand rejected under 35 USC §101 as not pertaining to statutory subject matter. Applicant has amended the preambles of the independent claims 1 and 22 to clearly illustrate the claims are directed to statutory subject matter within the meaning of 35 USC §101. For example, the preamble of claim 1 has been amended to "A **computer-implemented** method" (emphasis added). In another example, the preamble of claim 22 has been amended to recite "a **tangible** computer-readable **data storage medium**" (emphasis added). The preambles of claims 13 and 34, as filed, are already directed to "a computing device", which represents a machine or manufacture and statutory subject matter within the meaning of 35 USC §101. Claims 2-12, 14-21, 23-33, and 35-40 depend from respective ones of these independent claims and are also directed to statutory subject matter at least for reasons based on these respective dependencies. Accordingly, claims 1-40 are directed to statutory subject matter within the meaning of 35 USC §101.

Independent claims 1, 13, 22 and 34 have been amended to show a tangible useful result. Specifically, claims 1, 13, 22 and 34 have been amended to indicate that "the reinforced clusters are for use by a search term suggestion component to respond to a search query from a user with terms relevant to the search query". Therefore, claims 1, 13, 22 and 34 recite sufficient human purpose and tangible results for mechanical products and processes within the meaning of utility under 35 USC §101. These claim amendments do not present any new matter as evidenced by



already examined subject matter of claims 12, 21 and 33. (E.g., claim 12 as filed was directed to "responsive to receiving a term from a user, comparing the term with a feature space of objects in the reinforced clusters", "responsive to comparing, identifying one or more search term suggestions", and "communicating the search term suggestions to the user"). Furthermore, these claim amendments are supported by the specification, for example, at paragraphs [0080] through [0083], which describe such operations in reference to Figs. 4 and 5. Claims 2-12, 14-21, 23-33, and 35-40 depend from respective ones of these independent claims and are also directed to subject matter with a tangible result and utility at least for reasons based on these respective dependencies.

Accordingly, withdrawal of the 35 USC §101 rejections claims 1-11, 13, 20, 22-32 and 34-39 is respectfully requested.

### **35 USC §102 Rejections**

Claims 1-5, 7-10, 13-15, 17-20, 22-26, 28-31, 34-35, and 37-39 stand rejected under 35 USC §102(e) as being anticipated by US Patent publication number 2003/0110181 to Schuetze. These rejections are traversed. The M.P.E.P. §2131 states that a claim is anticipated by a reference **only** if each and every element as set forth in the claim can be found in the reference and, furthermore, that the **identical** invention **must** be shown in as complete detail as is contained in the claim. Each of claims rejected under this basis include at least one feature not described by Schuetze. For at least this reason, the rejections under 35 U.S.C. § 102 of claims 1-5, 7-10, 13-15, 17-20, 22-26, 28-31, 34-35, and 37-39 should be withdrawn. Examples of claim features not found in Schuetze are given below.

Independent **claim 1** recites in part:

- “identifying relationships between multi-type data objects, wherein the multi-type data objects comprise at least one object of a first type and at least one object of a second type different from the first type”, and
- “iteratively clustering the multi-type data objects in view of respective ones of the relationships to generate reinforced clusters”.

Significantly, Schuetze does not cluster multi-type data objects in view of respective relationships between data objects of different data types. Thus, Schuetze cannot describe “the reinforced clusters” as claim 1 requires.

Moreover, Applicant respectfully submits that such a feature is not necessarily present in Schuetze.

For example, in addressing claim 1, the Action asserts that the features of claim 1 are described at [0022]. However, this paragraph merely indicates that disparate types of information such as text, image features and usage are referred to as modalities, and multi-modal clustering operations are used to group objects of different modalities. This description is completely silent with respect to and description of identifying relationships between data objects of different modalities. In fact, Schuetze does not describe “identifying relationships between multi-type data objects, wherein the multi-type data objects comprise at least one object of a first type and at least one object of a second type different from the first type”, as claim 1 requires.

Schuetze clearly describes at [0076] that each document added to a collection maps to a set of feature vectors, one feature vector for each modality (e.g., a text vector, a URL vector, etc.). Starting from [0081] Schuetze describes with respect to Fig. 3 that **document data of each respective modality are isolated** into different respective vectors (please see the data modality isolation operations of blocks 310, 312, 318, 326, and 322 of Fig. 3). Then, each modality is independently described with a separate vector (please see operations of blocks 316, 332, 340, 336, and 324 of Fig. 3). Paragraphs [0081] through [0083] describe creating respective and independent text vectors, URL vectors, link vectors, genre vectors, color complexity of vectors, histogram vectors, etc. Thus, the description of cited by the Action in paragraph [0022] merely introduces that disparate

types of information such as text, image features and usage are referred to as modalities without any description of identifying relationships between objects of differing modality.

Subsequent description of Schuetze clarifies that that data of each modality type is vectorized in view of data of that particular modality type. Plainly, this does not any operations to identify relationships between data of different modality type(s). Even if such independent vectors were to combined into a single vector, this appears to merely create a single vector with multimodal data, wherein data from each modality does not consider inter-modality relationships (i.e., relationships with data of differing modality). Clearly, this description of Schuetze is completely silent with respect to "identifying relationships between multi-type data objects, wherein the multi-type data objects comprise at least one object of a first type and at least one object of a second type different from the first type", as claim 1 requires. This is prima facie evidence that Schuetze does not anticipate claim 1.

Additionally, paragraph [0022] description indicating that "multi-modal clustering operations are used to group objects of different modalities" is completely silent with respect to " iteratively **clustering the multi-type data objects in view of respective ones of the relationships** to generate reinforced clusters", as claim 1 requires. For the reasons discussed above, Schuetze does not describe identifying any relationships between data of multimodal data type. Moreover, the description cited by the Action at [0043] (i.e., "iterative clustering and selection of cluster subsets can help a user identify images of interest") does not provide any further

description of these claimed features. Instead, Schuetze describes that **clustering is based on determining similarity metrics between vectors of same modal data type**. Paragraph [0099] describes how similarity between two text vectors is calculated; paragraph [109] describes how similarity metrics between multiple genre vectors is calculated, and so on. Nowhere does Schuetze describe calculating similarity metrics between data of different modalities. At paragraph [0131] Schuetze describes that these similarity metrics are used to cluster documents using a standard clustering algorithm. Clearly, this description of Schuetze is also completely silent with respect to “iteratively clustering the multi-type data objects in view of respective ones of the relationships to generate reinforced clusters”, as claim 1 requires. This is additional prima facie evidence that Schuetze does not anticipate claim 1.

For each of the above reasons, each and every element as set forth in claim 1 can not be found in Schuetze, and the **identical** invention of claim 1 is not shown in as complete detail as is contained in claim 1. Accordingly, Schuetze does not anticipate the features of claim 1. Withdrawal of the 35 USC §102(e) rejection of claim 1 is respectfully requested.

Each of the remaining **independent pending claims 13, 22 and 34** also recite features directed to identifying relationships between multi-type data objects to generate reinforced clusters based on these relationships. For the reasons already discussed above with respect to claim 1, Schuetze does not anticipate such required features. For these reasons alone, withdrawal of the 35 USC §102(b) rejection of claims 13, 22 and 34 is

respectfully requested. All remaining rejected dependent claims (i.e., claims 2-5, 7-10, 14-15, 17-20, 23-26, 28-31, 35 and 37-39) depend on respective ones of these allowable independent claims 1, 13, 22 and 34. At least for these reasons based on their respective dependencies, these dependent claims are not anticipated by Schuetze.

Accordingly, withdrawal of the 35 USC §102(e) rejection of claims 2-5, 7-10, 13-15, 17-20, 22-26, 28-31, 34, 35 and 37-39 is also respectfully requested.

### **35 USC §103 Rejections**

Claims 6, 12, 16, 21, 27, 33, 36 and 40 stand rejected under 35 USC §103(a) as being unpatentable over Schuetze and further in view of US patent application serial no. 6,169,986 to Bowman et al. ("Bowman"). However, the M.P.E.P. states that, to support the rejection of a claim under 35 U.S.C. § 103(a), each feature of each rejected claim must be taught or suggested by the applied references, and that each of the words describing the feature must be taken into account.

To establish *prima facie* obviousness of a claimed invention, **all** the claim limitations **must** be taught or suggested by the prior art. ... **All** words in a claim **must** be considered in judging the patentability of that claim against the prior art.

(M.P.E.P. § 2143.03, emphasis added). Independent claims 1, 13, 22 and 34 are base claims of particular ones of dependent claims 6, 12, 16, 21, 27, 33, 36 and 40. Each of the amended independent claims 1, 13, 22 and 34 herein includes at least one feature not taught or fairly suggested by

Schuetze, alone or in combination with Bowman, and is therefore patentable for at least this reason.

In particular, each of the independent claims 1, 13, 22 and 34 recites features directed to identifying relationships between multi-type data objects to generate reinforced clusters based on these relationships. In contrast, Schuetze performs data clustering operations completely independent of any relationships between data objects of one modality to data objects in different modalities. Thus, Schuetze can not be said, at least for the purposes of applying the reference to independent claim 1, to disclose or teach "identifying relationships between multi-type data objects, wherein the multi-type data objects comprise at least one object of a first type and at least one object of a second type different from the first type", and "iteratively clustering the multi-type data objects in view of respective ones of the relationships to generate reinforced clusters", as claim 1 requires.

With respect to **claim 6, 16 and 27**, the Action combines the primary reference Schuetze with Bowman for the teaching of "a search term suggestion". Assuming *arguendo* that Bowman teaches such a feature, it is clear that such a feature combined with Schuetze does not cure the above described teaching deficiencies of Schuetze regarding claim 1. Thus, Schuetze and/or Bowman alone or in combination do not teach or suggest the above recited features of claim 1. Claim 6 depends from claim 1 and is therefore not obvious over the cited combination at least for reasons based on their respective dependencies. Additionally, amended **independent claims 13 and 22** each include salient features similar to

those of independent claim 1 and are not obvious over the cited combination for the same or similar reasons. **Dependent claims 16 and 27** depend from respective ones of claims 13 and 22 and are therefore not obvious over the cited combination at least for reasons based on their respective dependencies.

Withdrawal of the 35 USC §103(a) rejection of claims 6, 16 and 27 is respectfully requested.

Regarding **claims 12, 21, 33 and 40**, the Action admits that the primary reference does not teach or suggest the subject matter of the claims 1, 13, 22 and 34 upon which these claims depend. The Action modifies the primary reference attempting to arrive at the respective features of dependent claims 12, 21, 33 and 40. However, for the reasons already discussed above with respect to claim 1, claims 12, 21, 33 and 40 are not obvious over the cited combination at least for reasons based on their respective dependencies to claims 1, 13, 22 and 34. Withdrawal of the 35 USC §103(a) rejection of claims 12, 21, 33 and 40 is respectfully requested.

Claims 11 and 32 stand rejected under 35 USC §103(a) as being unpatentable over Schuetze and further in view of US patent application serial no. 5,812,134 to Pooser et al. ("Pooser"). As a preliminary matter, the Action first asserts that the primary reference teaches the features of the independent claims 10 and 31 upon which these rejected claims 11 and 32 respectively depend. Then, the Action concedes that the primary reference does not teach **“mutually reinforcing the importance of individual ones of the multi-type data objects within an object type and between different object types”**. Applicant agrees with this latter statement.



Significantly, these exact features that the Action first indicates are taught and then indicates are not taught by the primary reference are also recited in both claims 10 and 31 upon which the rejected claims depend. If the Office stands by the latter statement, then the Office already recognizes that the primary reference clearly does not teach **“mutually reinforcing the importance of individual ones of the multi-type data objects within an object type and between different object types”**, as claims 10 and 31 recite. This statement by the Office clearly should be given weight when evaluating the above 35 USC 102(e) rejections of claims 10 and 31 which assert that the primary reference describes each and every element of claims 10 and 31.

With respect to **claims 11 and 32**, the Action combines the primary reference Schuetze with Pooser for the teaching of “mutually reinforcing the importance of individual ones of the multi-type data objects within an object type and between different object types”. Even if Pooser taught such a feature, which it does not for the reasons described below, it is clear for the reasons already discussed that such a feature combined with Schuetze does not cure the above described teaching deficiencies of Schuetze regarding independent claims 1 and 22, upon which claims 11 and 32 respectively depend. For this reason alone, the cited combination does not teach or suggest the features of claims 11 and 32.

Moreover, Pooser does not teach or suggest:

*“wherein mutually reinforcing the importance of individual ones of the multi-type data objects within an object type and between different object types is based on the following:*

$$\left\{ \begin{array}{l} a(X) = \beta L_X^T h(X) + (1 - \beta) L_{XY} i(Y) \\ h(X) = \beta L_X a(X) + (1 - \beta) L_{XY} i(Y) \\ i(X) = a(X) + h(X) \\ a(Y) = \gamma L_Y^T h(Y) + (1 - \gamma) L_{YX} i(X) \\ h(Y) = \gamma L_Y a(Y) + (1 - \gamma) L_{YX} i(X) \\ i(Y) = a(Y) + h(Y) \end{array} \right.$$

wherein  $X = \{x_1, x_2, \dots, x_m\}$  and  $Y = \{y_1, y_2, \dots, y_n\}$  represent respective object sets of heterogeneous object type with relationships  $R_X$ ,  $R_Y$ ,  $R_{XY}$  and  $R_{YX}$  if directionality is considered,  $L_X$  and  $L_Y$  represent adjacent matrixes of links identifying relationships within set  $X$  and  $Y$  respectively,  $L_{XY}$  and  $L_{YX}$  represent adjacent matrixes of links identifying relationships from objects in  $X$  to objects in  $Y$ ,  $a(X)$  and  $h(X)$  are an authority score and hub score of nodes within  $X$  respectively,  $a(Y)$  and  $h(Y)$  respectively represent authority and hub scores of nodes in  $Y$ ,  $i(X)$  and  $i(Y)$  respectively represent an importance of the nodes in  $X$  and  $Y$ , and  $\beta$  and  $\gamma$  are weight parameters to adjust influence of links derived from different relationships",

as claims 11 and 32 recite. The Action asserts that these features are taught by Fig. 4 and associated detailed description. Applicant disagrees. "Fig. 4 is a diagram of an exemplary information 'molecule'" (column 6, lines 63 and 64). The portions of col. 8, paragraphs 4, 5, and 6 that the Action cites merely describe organizational structure of a hyper-media database, which includes at least one node which is a collection of elements pointing to data objects of multiple different types -- and threads that are collections of nodes. Clearly, these teaching are completely silent with respect to any teaching or fair suggestion of the above recited features of claim 11. This is not surprising as Pooser does not teach or fairly suggest "mutually

reinforcing the importance" of anything. In fact, the description in Pooser does not even include or fairly suggest the words "mutual", "mutually", "reinforce", "reinforcing", "important", "importance", "hub", "authority", etc. Thus, it is clear that all of the words in claims 11 and 32 have not been considered in judging the patentability of these claims against the prior art. Withdrawal of the 35 USC §103(a) rejection of claims 11 and 32 is respectfully requested.

### **Conclusion**

Pending claims 1-40 are in condition for allowance and action to that end is respectfully requested. Should any issue remain that prevents allowance of the application, the Office is encouraged to contact the undersigned to discuss this case prior to issuing any subsequent Action.

Respectfully Submitted,

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